ACRF Instrument Report

Radiative Processes/Cloud Modeling Working Group Meeting
Princeton, NJ - November 19, 2008

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ARM
A climate change research program
www.arm.gov
Office of Science
U.S. DEPARTMENT OF ENERGY

Outline

- Process
- Instrument and Measurement Focus Groups
- FY2008 Plan Outcomes
- Instrument Plan for FY2009
- Draft Instrument Plan for FY2010
- Draft Instrument Plan for FY2011
- Request for Input, Discussion, Prioritization, and Ranking

Process

Process(1)

- ACRF Instrument investments (capital and expense) are driven by science needs
- What measurements and data products are needed to accomplish program science objectives?
- There are three important aspects...

Process(2)

1. Maintain, sustain, and modernize installed instruments (aging, quality, error analysis, calibration, documentation)
2. Evolve and optimize the spatial (horizontal and vertical), temporal, resolution, and accuracy of our instruments and measurements
3. Addition of new instruments and measurements to address science objectives

Process(3)

- Science working groups define needs, review Instrument Plan, and make recommendations
- Consider complete life-cycle; procurement, engineering, operations, mentoring, documentation, processing, special data products
- Objective 1- communicate approved FY2009 plan
- Objective 2- discuss FY2010 plan, prioritize and rank recommendations

Process(4)

- Objective 3- discuss and recommend out-year strategies for FY2011- and 2012 if reasonable
- Input from each science working group are integrated and presented to the IMB and SISC (December & Science Team Meetings)
- DOE Program Management approves FY2010 plan
- ACRF Technical Coordination office executes FY2010 plan

Instrument and Measurement Focus Groups

Instrument and Measurement Focus Groups(1)

- "a new approach" - Principles and Objectives in review by program management
- Provide a forum based on specific (critical) instrument and measurements needs
- Group charter, leader, and membership communicated to and approved by program management
- Goal- communicate and recommend actions
- Then "recycle group"

Instrument and Measurement Focus Groups(2)

~ Current Groups ~

- Radars - Kevin Widener
- Microwave Radiometry - Maria Caddedu
- Lidars - Jennifer Comstock
- More to come...

FY2008 Plan Outcomes

FY2008 Plan Outcomes Radars(1)

- Add Scanning Capability to WACR, Kevin Widener - ECO-00658, in process
- MMCR end-to-end calibration analysis, Kevin Widener- ECO-00655/00680, in process
- MMCR signal processor (PIRAC) upgrade for SGP, Kevin Widener - ECO-00658, complete

FY2008 Plan Outcomes Radars(2)

- WACR spectral notch filter, Kevin Widener- ECO-00654, in process
- Radar maintenance purchases- coherent up-down converter, 2 traveling wave tubes, and 2 new antennas
- Darwin C-Pol Radar upgrades, Peter May- in process

More FY2008 Plan Outcomes(1)

- Deploy next generation MWR (2 each), Maria Cadeddu - ECO-00665, in process
- Add Aerodynamic Particle Sizer to the TDMA instrument, Don Collins- ECO-00640, installation complete
- Add Photo-Acoustic Soot Spectrometer to the SGP aerosol suite, Manvendra Dubey - ECO-00663, in process

More FY2008 Plan Outcomes(2)

- Upgrade radiometer calibration facility computing, Tom Stoffel - ECO-00642, in process
- Refurbish Rotating Shadowband Spectrometer, Peter Kiedron- ECO-00635, in process
- 50 MHz (SGP) profiler decommissioning, Rich Coulter/Brad Orr - ECO-00662, in process

More FY2008 Plan Outcomes(3)

- Replace EBBR temperature and relative humidity probes, Dave Cook- ECO-00642, in process
- SWATS Sensor Array Upgrades, Daniel Hartsock- ECO-00493, in process
- Continuation of IRT Network, Vic Morris- ECO-00345, in process

More FY2008 Plan Outcomes(4)

- MFRSR Data Logger Upgrades, Gary Hodges- ECO-00350, in process
- and, Aerosol Chemistry products, NOAA PMEL, Trish Quinn- end with FY2008
- **$2,141,515 of Capital and Expense invested in FY2008**

Instrument Plan for FY2009

FY2009 Capital - Approved

MMCR	2 each, 6 ft. Antenna/Tropics	$184,040
MMCR	3 each, Traveling Wave Tubes	$210,000
MWR	3 each, Next Generation	$570,000
Carbon	Co2 Flux Measurements	$56,000
Tele-Mover	Safety/Operations (NSA)	$75,000
	Subtotal	**$1,095,040**
Funds Available	Expected + Carryover	**$1,338,345**
	Balance	**$243,305**

FY2009 Expense - Approved

IRT Network	Instruments, Enclosures, Loggers (SGP)	$8,650
Albedo Meas.	One MFR System (AMF)	$16,250
Sonde Upgrade	6 each, Digi-Cora I/II Chipsets	$21,600
Carbon	System Consumables (SGP)	$15,000
EBBR	Phase 2 of 4 Upgrades (T/Rh)	$12,000
SWATS	Phase 4 of 4 Sensor	$13,000
Albedo Meas.	Engineering (AMF)	$5,000
Photo-Acoustic	Mentor Support/Operations	$87,000
Archive	Phase 1 of 2 Capacity Upgrades	$170,000

FY2009 Expense - Approved

Scanning-WACR	Initial SWACR Data Products	$95,000
Engineering	Unanticipated Engineering	$200,000
Data System	Maintenance and Performance	$226,000
	Subtotal	**$869,500**
Funds Available	Expected	**$907,000**
	Balance	**$37,500**

Draft Instrument Plan for FY2010

FY2010 Capital - Draft

MMCR	3 each, Traveling Wave Tubes	$210,000
MWR	1 each, Next Generation	$190,000
Archive	Capacity Upgrades	$100,000
	Subtotal	**$500,000**
Funds Available	Expected + Carryover	**$1,243,305**
	Balance	**$743,305**

FY2010 Expense - Draft

Albedo Meas.	Second MFR System (AMF)	$26,250
AERI Spares	Calibration and system components	$139,056
Radiometer Calibration	Upgrade aging infrastructure (SIRS, BORCAL, IRCAL)	$226,638
Sonde Upgrades	2 each, Digi-Cora I/II Chipsets	$7,200
Carbon	System Consumables (SGP)	$20,000
EBBR	Phase 3 of 4 Upgrades (T/Rh)	$12,000
Albedo Meas.	Engineering (AMF)	$5,000
Photo-Acoustic	Mentor Support/Operations	$87,000

FY2010 Expense - Draft

UV Monitoring	Establish DOE-NOAA/EPA UV/Ozone network (SGP)	$70,000
Carbon	Measurement Operations	$270,000
Archive	Phase 2 of 2 Capacity Upgrades	$200,000
S-WACR	Data Products, second year	$88,000
Engineering	Unanticipated Engineering	$200,000
Data System	Maintenance and Performance	$276,000
	Subtotal	**$1,627,144**
Funds Available	Expected	**$982,000**
	Balance	**-$645,144**

Draft Instrument Plan for FY2011

FY2011 Capital - Draft

MMCR	3 each, Traveling Wave Tubes	$210,000
MWR	2 each, Next Generation	$380,000
	Subtotal	**$590,000**
Funds Available	Expected + Carryover	**$1,743,305**
	Balance	**$1,153,305**

FY2011 Expense - Draft

Carbon	System Consumables	$20,000
EBBR	Phase 4 of 4 Upgrades (T/Rh)	$12,000
Photo-Acoustic	Mentor Support/Operations	$87,000
UV Monitoring	Establish DOE-NOAA/EPA UV/Ozone network (SGP)	$70,000
Carbon	Measurement Operations	$270,000

FY2011 Expense - Draft

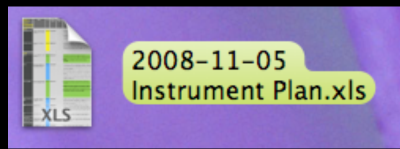
S-WACR	SWACR Data Products, Year 3	$90,000
Engineering	Unanticipated Engineering	$200,000
Data System	Maintenance and Performance	$280,000
	Subtotal	**$1,029,000**
Funds Available	Expected	**$982,000**
	Balance	**-$47,000**

Request for Input, Discussion, Prioritization, and Ranking

Input and Discussion

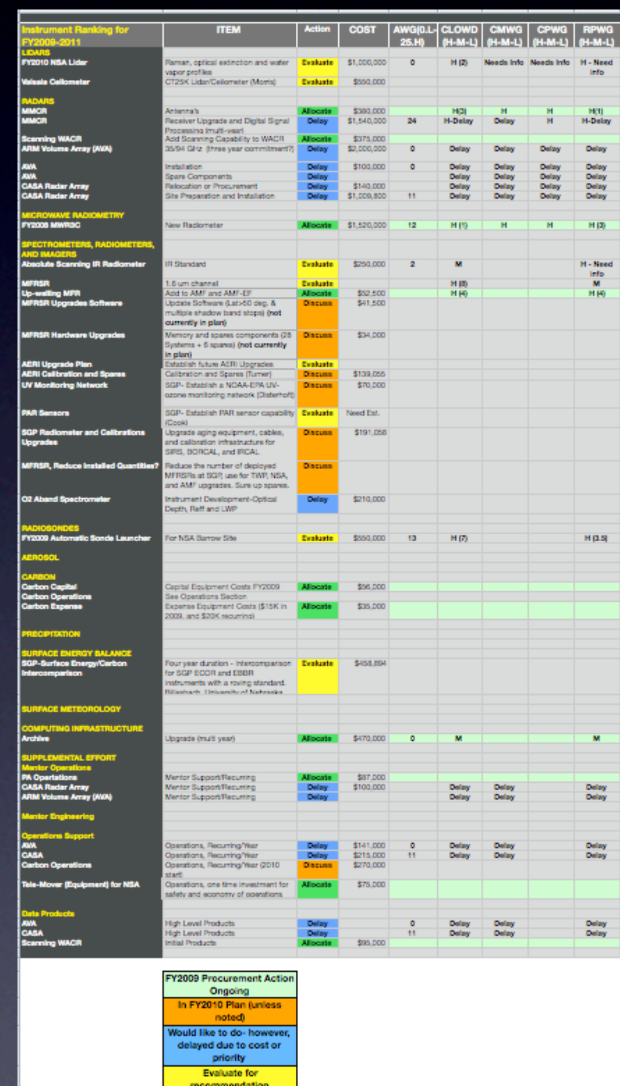
- Recommend adjustments to "Approved" FY2009 Instrument Plan
- Discuss, evaluate, recommend (prioritize and rank) needs for FY2010, FY2011, and if reasonable- FY2012
- AMF2 instruments are a high priority- procurements are defined by AMF2 team and coordinated with other activities

Excel Worksheet, provided, has three components



A	B	C	D	E	F
RADIOSONDES					
FY2009 Automatic Sonde Launcher	For NSA Barrow Site (Coulter)	Evaluate			The technical feasibility of using this technology at high latitudes has been validated.
AEROSOL					
CARBON					
Carbon Measurements	SGP Co2 Fluxes Capital Equipment (Torn)	Allocate	$56,000		To purchase new CO2 measurement instrumentation to replace the current aging installed systems.
Carbon Measurements	SGP Co2 Flux Measurements Consumables (Torn)	Allocate		$35,000	Annual (first two years) maintenance, supplies, and consumables for the CO2 instrument systems. First year $15K each subsequent year is $20K.
PRECIPITATION					
SURFACE ENERGY BALANCE					
SGP-Surface Energy/Carbon Intercomparison	Intercomparison for SGP ECOR and EBBR instruments with a roving standard. Billesbach, University of Nebraska (Billesbach)	Evaluate		$458,894	Equipment and labor for Dave Billesbach, University of Nebraska to establish a 4 year intercomparison of the ACRF/SGP ECOR and EBBR instrument systems with a single roving standardized instrument package.
SURFACE METEOROLOGY					
COMPUTING INFRASTRUCTURE					
Archive	Upgrade (multi year) (McCord)	Allocate	$100,000	$370,000	This capital request for the Archive is to modernize the computing, mass storage, and networking equipment necessary to sustain this capability, to keep up with increasing processing and transaction loads. This includes the addition of new instrumentation and capability to provide statistical and tailored views of ACRF holdings. **2008.06 Budget adjusted from $600K Capital to - $100K Capital and $370K Expense.**
SUPPLEMENTAL EFFORT					
Mentor Operations					
ARM Volume Array (AVA)	Mentor Support/Recurring (Radar Group)	Delay			Understand the impact of adding this instrument system to the Radar Mentor responsibilities. Develop budget as required.
CASA	Mentor Support/Recurring (Radar Group)	Delay		$100,000	For mentor, software, and data product support.
PA	Photo Acoustic Soot Spectrometer/SGP AOS (Manvendra Dubey)	Allocate		$87,000	Annual cost for the operational mentoring of PA.
Carbon Measurements	SGP Co2 Fluxes Expense Labor for Operations (Torn)	Discuss		$270,000	Provide Instrument Mentorship of the Carbon suite of instrumentation on the SGP CF. A second cost proposal is presented, for $400K, to broaden the effort to include Carbon and surface flux measurements.
Mentor Engineering					
Operations Support					
AVA Mentor	Operations, Recurring/Year	Delay		$141,000	Includes full-time radar tech, lease, and utility costs. Not mentor cost.
CASA	Operations, Recurring/Year	Delay		$215,000	Includes full-time radar tech, lease, and utility costs. Not mentor cost.
Carbon Operations	Operations, Recurring/Year (2010 start)	Discuss		$270,000	
Tele-Mover (Equipment) for NSA	Operations, one time investment for safety and economy of operations	Allocate	$75,000		Purchase Tele-Mover for NSA perations
Data Products					
AVA	High Level Products (Radar Group)	Delay			Full-time, knowledgeable hardworking researcher and developer (1/2 time in first year, full time for the second year -- then decreasing) these costs are expected to decrease after deployment. Approximate costs for developer/researcher per year is $250K.
CASA	High Level Products (Radar Group)	Delay			Need Estimate. If required.
MWR Future	Next Generation Retrievals and High Level Products (Caddedu)	Delay			With the development of a MWR specified to span broad ranges of PWV and LWP (including precipitation)--the retrievals need to be evaluated due to droplet scattering (no longer just emissions?) and droplet size distributions.
Scanning WACR	Initial Products (Kollias)	Allocate		$95,000	Develop data product for S-WACR. Pavlos Kollias/McGill University. **Allocated for FY2009 - are there out-year needs?**
Total of Requests			$8,729,840	$2,612,287	

FY2009 Procurement Action Ongoing
In FY2010 Plan (unless noted)
Would like to do, however, delayed due to cost or priority
Evaluate for recommendation



Instrument Ranking for FY2009-2011	ITEM	Action	COST	AWG(0.L-25.H)	CLOWD (H-M-L)	CMWG (H-M-L)	CPWG (H-M-L)	RPWG (H-M-L)
LIDARS								
FY2010 NSA Lidar	Raman, optical extinction and water vapor profiles	Evaluate	$1,000,000	0	H (2)	Needs Info	Needs Info	H - Need info
Vaisala Ceilometer	CT25K Lidar/Ceilometer (Morris)	Evaluate	$550,000					
RADARS								
MMCR	Antenna's	Allocate	$380,000		H(3)	H	H	H(1)
MMCR	Receiver Upgrade and Digital Signal Processing (multi-year)	Delay	$1,540,000	24	H-Delay	Delay	H	H-Delay
Scanning WACR	Add Scanning Capability to WACR	Allocate	$375,000					
ARM Volume Array (AVA)	35/94 GHz (three year commitment?)	Delay	$2,000,000	0	Delay	Delay	Delay	Delay
AVA	Installation	Delay	$100,000	0	Delay	Delay	Delay	Delay
AVA	Spare Components	Delay			Delay	Delay	Delay	Delay
CASA Radar Array	Relocation or Procurement	Delay	$140,000		Delay	Delay	Delay	Delay
CASA Radar Array	Site Preparation and Installation	Delay	$1,009,800	11	Delay	Delay	Delay	Delay
MICROWAVE RADIOMETRY								
FY2008 MWR3C	New Radiometer	Allocate	$1,520,000	12	H (1)	H	H	H (3)
SPECTROMETERS, RADIOMETERS, AND IMAGERS								
Absolute Scanning IR Radiometer	IR Standard	Evaluate	$250,000	2	M			H - Need info
MFRSR	1.6 um channel	Evaluate			H (8)			M
Up-welling MFR	Add to AMF and AMF-EF	Allocate	$52,500		H (4)			H (4)
MFRSR Upgrades Software	Update Software (Lat>60 deg. & multiple shadow band stops) (not currently in plan)	Discuss	$41,500					
MFRSR Hardware Upgrades	Memory and spares components (28 Systems + 6 spares) (not currently in plan)	Discuss	$34,000					
AERI Upgrade Plan	Establish future AERI Upgrades	Evaluate						
AERI Calibration and Spares	Calibration and Spares (Turner)	Discuss	$139,055					
UV Monitoring Network	SGP- Establish a NOAA-EPA UV-ozone monitoring network (Disterhoft)	Discuss	$70,000					
PAR Sensors	SGP- Establish PAR sensor capability (Cook)	Evaluate	Need Est.					
SGP Radiometer and Calibrations Upgrades	Upgrade aging equipment, cables, and calibration infrastructure for SIRS, BORCAL, and IRCAL	Discuss	$191,058					
MFRSR, Reduce Installed Quantities?	Reduce the number of deployed MFRSRs at SGP, use for TWP, NSA, and AMF upgrades. Sure up spares.	Discuss						
O2 Aband Spectrometer	Instrument Development-Optical Depth, Reff and LWP	Delay	$210,000					
RADIOSONDES								
FY2009 Automatic Sonde Launcher	For NSA Barrow Site	Evaluate	$550,000	13	H (7)			H (3.5)
AEROSOL								
CARBON								
Carbon Capital	Capital Equipment Costs FY2009	Allocate	$56,000					
Carbon Operations	See Operations Section							
Carbon Expense	Expense Equipment Costs ($15K in 2009, and $20K recurring)	Allocate	$35,000					
PRECIPITATION								
SURFACE ENERGY BALANCE								
SGP-Surface Energy/Carbon Intercomparison	Four year duration - Intercomparison for SGP ECOR and EBBR instruments with a roving standard. Billesbach, University of Nebraska	Evaluate	$458,894					
SURFACE METEOROLOGY								
COMPUTING INFRASTRUCTURE								
Archive	Upgrade (multi year)	Allocate	$470,000	0	M			M
SUPPLEMENTAL EFFORT								
Mentor Operations								
PA Opertations	Mentor Support/Recurring	Allocate	$87,000					
CASA Radar Array	Mentor Support/Recurring	Delay	$100,000		Delay	Delay		Delay
ARM Volume Array (AVA)	Mentor Support/Recurring	Delay			Delay	Delay		Delay
Mentor Engineering								
Operations Support								
AVA	Operations, Recurring/Year	Delay	$141,000	0	Delay	Delay		Delay
CASA	Operations, Recurring/Year	Delay	$215,000	11	Delay	Delay		Delay
Carbon Operations	Operations, Recurring/Year (2010 start)	Discuss	$270,000					
Tele-Mover (Equipment) for NSA	Operations, one time investment for safety and economy of operations	Allocate	$75,000					
Data Products								
AVA	High Level Products	Delay		0	Delay	Delay		Delay
CASA	High Level Products	Delay		11	Delay	Delay		Delay
Scanning WACR	Initial Products	Allocate	$95,000					

FY2009 Procurement Action Ongoing
In FY2010 Plan (unless noted)
Would like to do- however, delayed due to cost or priority
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Discussion

Ranking

Summary

Thank You